

CHAPTER 205 EXISTING INSTALLATIONS OF POWER BOILERS

[Prior to 9/24/86, Labor, Bureau of [530]]
[Prior to 1/14/98, see Labor Services[875] Ch 44]

875—205.1(89) Maximum allowable working pressure.

205.1(1) Working pressure—shell. The maximum allowable working pressure on the shell of a boiler shall be determined by the strength of the weakest course computed from the thickness of the plate, the tensile strength of the plate, the efficiency of the longitudinal joint, the inside diameter of the course, and the factor of safety allowed by these rules. The formula for determining the maximum allowable working pressure is:

$\frac{TSStE}{RFS}$ = Maximum allowable working pressure, psig.

Where:

- TS = Ultimate tensile strength of shell plate(s), psig. When the tensile strength of a steel plate(s) is unknown, it shall be taken as 55,000 psig for temperatures not exceeding 650 degrees F.
- t = Minimum thickness of shell plates of the weakest course, in inches.
- E = Efficiency of longitudinal joint calculated pursuant to ANSI/ASME BPV-1-PG-27 (1995 with 1997 addenda).
- R = Inside radius of the weakest course of the shell or drum, in inches.
- FS = Factor of safety specified in subrule 205.1(2).

205.1(2) Factor of safety.

a. The lowest factor of safety on boilers shall be four, except for horizontal tubular boilers having continuous lap seams more than 12 feet in length where the factor of safety shall be eight.

b. Boilers which are reinstalled of lap riveted construction or seams of butt and double strap riveted construction shall use ASME Code, Section I (1971).

c. A boiler constructed with fusion-welded seams and not X-rayed and stress relieved during construction shall not be operated at a pressure in excess of 15 pounds per square inch. Boilers with fusion-welded seams which are X-rayed and stress relieved and constructed to ASME Code requirements in effect when the boiler was constructed may be operated at a pressure as established in subrule 205.1(1).

d. The factor of safety shall be increased by the inspector if the conditions and safety of the boiler demand it.

875—205.2(89) Cast iron headers and mud drums.

205.2(1) Tube boiler. The maximum allowable working pressure on a water tube boiler, the tubes of which are secured in cast iron or malleable iron headers or which have cast iron mud drums, shall not exceed 160 psig or a temperature of 250° F.

205.2(2) Maximum steam pressure. The maximum steam pressure on any boiler in which steam is generated, if constructed of cast iron, shall be 15 psig.

875—205.3(89) Rivets. When the diameter of the rivet holes in the longitudinal joints of a boiler is not known, the diameter and cross-sectional area of rivets, after driving, shall be selected from ASME Code, Section I (1971).

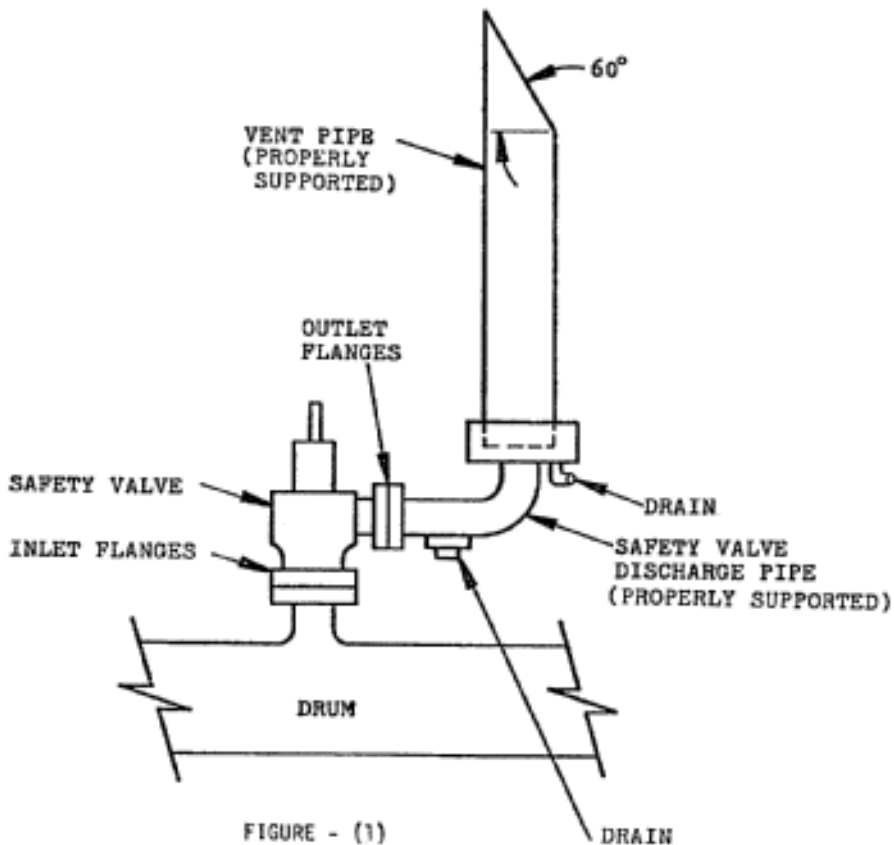
875—205.4(89) Safety valves.

205.4(1) The use of weighted-lever safety valves or safety valves having either the seat or disk of cast iron is prohibited. All power boilers shall have direct, springloaded, pop-type safety valves that conform to the requirements of ASME Code, Section I (1995 with 1997 addenda).

205.4(2) Each boiler shall have at least one safety valve. All boilers with more than 500 square feet of water heating surface or an electric power input of more than 1100 kilowatts shall have two or more safety valves.

205.4(3) The safety valve or valves shall be connected to the boiler independent of any other steam connection and attached as close as possible to the boiler without unnecessary intervening pipe or fittings.

205.4(4) No valves of any type shall be placed between the safety valve and the boiler. If an escape pipe is used no valve shall be placed between the safety valve and the atmosphere. When an escape pipe is used, it shall be at least full size of the safety-valve discharge and fitted with an open drain to prevent water lodging in the upper part of the safety valve or escape pipe. Any elbow on an escape pipe shall be located close to the safety-valve outlet or the escape pipe and shall be anchored and supported securely. All safety valve discharges shall be so located or piped as to be carried away from walkways or platforms. When the safety valve is vented to the outside atmosphere the second escape pipe shall be arranged as shown in Figure 1.



205.4(5) The safety-valve capacity of each boiler shall be such that the safety valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 5 percent above the highest pressure to which any valve is set and in no case to more than 6 percent above maximum allowable working pressure.

205.4(6) One or more safety valves on every boiler shall be set at or below the maximum allowable working pressure. The remaining valves may be set within a range of 3 percent above the maximum allowable working pressure but the range setting of all the safety valves on a boiler shall not exceed 10 percent of the highest pressure at which any valve is set.

205.4(7) When two or more boilers operating at different pressures and safety-valve settings are interconnected, the lowest pressure boilers or interconnected piping shall be equipped with safety valves of sufficient capacity to prevent overpressure, considering the maximum generating capacity of all boilers.

205.4(8) In those cases where the boiler is supplied with feedwater directly from water mains without the use of feeding apparatus (not including return traps), safety valves shall not be set at a pressure greater than 94 percent of the lowest pressure maintained in the supply main feeding the boiler.

205.4(9) The minimum safety valve or safety-relief valve relieving capacity shall be determined on the basis of the pounds of steam generated per hour per square foot of boiler heating surface and waterwall heating surface as given in the following table. This method shall not be used on electric boilers, waste heat boilers and forced-flow steam generators without a fixed steam and water line.

Minimum Pounds of Steam Per Hour Per Square
Foot of Heating Surface

Boiler Heating Surface:	Firetube Boilers	Watertube Boilers
Hand Fired	5	6
Stoker Fired	5	8
Oil, Gas, or Pulverized Fuel Fires	8	10
Waterwall Heating Surface:		
Hand Fired	8	8
Stoker Fired	10	12
Oil, Gas, or Pulverized Fuel Fires	14	16

- 205.4(10)** Safety valve sizing.
- a.* When a boiler is fired only by a gas having a heat value not in excess of 200 Btu per cubic feet the minimum safety valve or safety-relief valve relieving capacity may be based on the value given for hand-fired boilers above.
 - b.* The minimum safety valve or safety-relief valve relieving capacity for electric boilers shall be 3 ½ pounds per hour per kilowatt input.
 - c.* For heating surface determination, see ASME Code, Section I, Appendix A 44, 1995 with 1997 addenda.
 - d.* Maximum steaming capacity for safety valves shall be the value stated on design documents or shall be calculated by multiplying horsepower by 34.5.

875—205.5(89) Boiler feeding.

205.5(1) Each boiler shall have a feed supply which will permit it to be fed at any time while under pressure. A boiler having more than 500 square feet of water-heating surface shall have at least two means of feeding, one of which shall be an approved feed pump, injector, or inspirator. One source of feed is directly from water mains at a pressure 6 percent greater than the set pressure of the safety valve with the highest pressure setting. Boilers fired by gaseous, liquid, or solid fuel in suspension may be equipped with a single means of feeding water provided means are furnished for the immediate shutoff of heat input prior to the water level reaching the lowest permissible level. The feedwater shall be introduced into the boiler in such a manner that it will not be discharged close to riveted joints of shell or furnace sheets, directly against surfaces exposed to products of combustion, or directed to surfaces subject to radiation from the fire. The feed piping to the boiler shall be provided with a check valve near the boiler and a stop valve between the check valve and the boiler.

205.5(2) When two or more boilers are fed from a common source, there shall also be a valve on the branch to each boiler between the check valve and source of supply. Whenever a globe valve is used on feed piping, the inlet shall be under the disk of the valve. In all cases where returns are fed back to the boiler by gravity, there shall be a check valve and stop valve in each return line, the stop valve to be placed between the boiler and the check valve, and both shall be located as close to the boiler as is practicable.

205.5(3) Where deaerating heaters are not employed, it is recommended that the temperature of the feedwater be not less than 120° F to avoid the possibility of setting up localized stress. Where deaerating heaters are employed, it is recommended that the minimum feedwater temperature be not less than 215° F so that dissolved gases may be thoroughly released.

875—205.6(89) Water level indicators. Except for damper regulator, feedwater regulator, low-water fuel cutout, drains, steam gages, or such apparatus that does not permit the escape of an appreciable amount of steam or water therefrom, outlet connections shall not be placed on the piping that connects the water column to the boiler. The water column shall be provided with a valved drain of at least ¾-inch piping size, the drain to be piped to a safe location. Each boiler shall have three or more gage cocks located within the visible length of the water glass, except when the boiler has two water glasses located at the same horizontal lines. Only two gage cocks are required on boilers not over 36 inches in diameter with a heating surface not exceeding 100 square feet. Gage cocks are not required on electric boilers.

875—205.7(89) Pressure gages. Each boiler shall have a pressure gage so located that is readable. The pressure gage shall be installed so that it shall at all times indicate the pressure in the boiler. Each steam boiler shall have the pressure gage connected to the steam space or to the water column or its steam connection. A valve or cock shall be placed in the gage connection adjacent to the gage. An additional valve or cock may be located near the boiler providing it is locked or sealed in the open position. No other shutoff valves shall be located between the gage and the boiler. The pipe connection shall be of ample size and arranged so that it may be cleared by blowing out. For a steam boiler the gage or connection shall contain a siphon or equivalent device which will develop and maintain a water seal that will prevent steam from entering the gage tube. Pressure gage connections shall be suitable for the maximum allowable working pressure and temperature, but if the temperature exceeds 406° F, brass or copper pipe or tubing shall not be used. The connections to the boiler, except the siphon, if used, shall not be less than ¼-inch standard pipe size but where steel or wrought iron pipe or tubing is used, they shall not be less than ½-inch inside diameter. The minimum size of a siphon, if used, shall be ¼-inch inside diameter. The dial of the pressure gage shall be graduated to approximately double the pressure at which the safety valve is set, but in no case to less than 1½ times this pressure.

875—205.8(89) Steam stop valves. Each steam outlet from a boiler, except safety valve and water-column connections, shall be fitted with a stop valve located as close as practicable to the boiler. When a stop valve is so located that water can accumulate, ample drains shall be provided. The drainage shall be piped to a safe location and shall not be discharged on the top of the boiler or its setting. When boilers provided with manholes are connected to a common steam main, the steam connection from each boiler shall be fitted with two stop valves having an ample freeblowing drain between them. The discharge of the drain shall be piped clear of the boiler setting. The stop valves shall consist of one automatic nonreturn valve next to the boiler and a second valve of the outside screw and yoke type.

875—205.9(89) Blowoff connection. Each boiler shall have a blowoff pipe fitted with valve or cock, in direct connection with the lowest water space practicable.

When the maximum allowable working pressure exceeds 125 psig, the blowoff pipe shall be at least extra heavy from the boiler to the valve or valves and shall run full size without reducers or bushings and galvanized shall not be used.

All fittings between the boiler and valve shall be steel or at least extra-heavy fittings of bronze, brass, malleable iron, or cast iron, all of which shall be suitable for the pressure and temperature. In case of replacement of pipe or fittings in the blowoff lines, as specified in this paragraph, they shall be installed in accordance with the rules of new installations.

When the maximum allowable working pressure exceeds 125 psig, each bottom blowoff pipe shall be fitted with at least a 250-pound standard valve or cock. Preferably two valves, or a valve and a cock, should be used on each blowoff, in which case such valves, or valve cock, shall be extra heavy.

A bottom blowoff pipe when exposed to direct furnace heat shall be protected by firebrick or other heat resisting material so arranged that the pipe may be inspected.

An opening in the boiler setting for a blowoff pipe shall be arranged to provide for free expansion and contraction.

875—205.10(89) Conditions not covered. Any condition not specifically covered by these rules shall be governed by the construction or installation code.

These rules are intended to implement Iowa Code chapter 89.

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